

# AN EMPIRICAL ALGORITHM TO MEASURE SOIL MOISTURE WITH IMAGING RADARS

Jakob van Zyl and Pascale Dubois

*Jet Propulsion Laboratory  
California Institute of Technology  
4800 Oak Grove Drive  
Pasadena, CA 91109  
e-mail jacobv@blacks.jpl.nasa.gov*

This paper describes an empirical algorithm to derive soil moisture information from multi-polarization radar images. The algorithm is based on model functions derived from scatterometer measurements, and uses the measured radar cross section at HH and VV polarizations. Using only the HH and VV returns makes the algorithm less sensitive to system cross-talk, and since these returns usually have better signal-to-noise ratios than the cross-polarized returns, the algorithm is less sensitive to system noise. Also, these co-polarized returns are less affected by the presence of vegetation than the cross-polarized, returns, so that our algorithm is also less sensitive to the presence of vegetation. One could also envision a simpler radar design, needing only one receiver, which in turn means better cross-calibration of the two signals would be possible. We will discuss the sensitivity of our algorithm to these factors.

We will show results of this algorithms applied to data acquired with the NASA/JPL multi-frequency and multi-polarization AIRSAR system, as well as from the SIR-C radar system, and compare our results to in situ measurements of soil moisture. We will also compare our results with those using the algorithm published by Oh *et al.*, which requires three radar channels, HH, VV and HV.